

Device for Wireless Communication between Computing Devices

Background and Summary of the Invention

[0001] Present invention relates to a communication device and a method of using it to enable wireless communication between computing devices.

[0002] As an example to demonstrate the functionalities and advantages of the communication device of present invention, printing support for wireless mobile devices (e.g. laptops, PDAs, mobile phones) will be described.

[0003] Most handheld devices (PDAs, mobile phones) today do not have printing support due to their low processing power and the lack of appropriate printer drivers. One current method of printing wirelessly from mobile devices such as PDAs or mobile phones requires that a user first install an appropriate printer driver corresponding to a device specific printer. One driver is required for each printer. However, most printer drivers are unavailable for operating systems that run on PDAs and mobile phones. Furthermore, it is difficult and burdensome for a user to install a new printer driver each time printing is attempted at a different printer. Also, to print wirelessly, the printer needs to be wireless-enabled. Most printers today are not wireless-enabled. Therefore, users of handheld device rely mainly on "synching" their devices with PCs to print. However, "synching" could be difficult when a user is traveling or "on the go." Concerns over security, privacy, and complications in installation processes discourage mobile users from synching with PCs in a business lounge, hotel business center, conference center or another person's office.

[0004] Wireless communication standards such as WiFi and Bluetooth "cut the wire", allowing the transfer of files between computing devices. Currently, however, privacy and security concerns dictate that a first computing device sending, transferring, or

retrieving file or data wirelessly to and from a second computing device (e.g. to its hard drive) requires that the user of the second computing device respond with an accept or reject command each time (e.g. through a user interface). This current method or process sacrifices the ease of use for wireless devices to safeguard security.

[0005] Another difficulty in using wireless communication today is that a user is expected to have technical knowledge of the installation and configuration of the wireless hardware and software (e.g., adapters, dongles, drivers, protocol stacks), and related security settings. The communication device of present invention significantly simplifies the configuration of wireless communications, making it much easier to use.

[0006] A communication device of present invention includes a structural, external interface (e.g., a USB interface) for connecting to a computing device, a wireless interface for making a wireless connection to a second computing device, and a memory or storage component for storing and embedding software for a variety of applications. The present invention provides wireless printing without the need to install a device specific printer driver each time at each new location for printing. Moreover, the invention enables wireless printing to any printer – not just to wireless printers. Furthermore, the present invention improves the above processes without compromising security or privacy. The present invention enables transferring of files and data wirelessly from one device to another and improves ease of use.

[0007] The communication device of present invention can be connected to a first computing device (e.g., a personal computer or PC) to enable instant wireless communication with a second computing device. No driver or software installation is needed in the first computing device. All software components required to enable the wireless communication are embedded in the communication device itself and can be automatically launched, installed and execute such as through an AutoRun process in the first computing device.

[0008] In addition, the embedded software components in the communication device can automatically uninstall or delete applications or data when the communication device is unplugged from the external port such as the USB or FireWire port. No data from the second computing device or from the communication device will be retained in the first computing device after the communication device is disconnected from the first device, thus enhancing privacy and security.

[0009] The present invention further allows a computing device to wirelessly provide services to other computing devices. As an examples of such a service, a PC can provide printing or data display services to a mobile computing device (e.g., a mobile computer, digital telephone, or digital camera). For example, a user of the mobile computing device can simply plug the communication device (e.g., size of an adapter or dongle) into a USB interface or port of the PC. The user can then instantly send a document or data over a wireless connection, through the communication device and to a printer connected to the PC, all directly from the mobile device. After the printing process has been completed, the communication device is unplugged from the PC and no data is retained by the PC. No printer driver installation is needed in the mobile device and the user can print to any printer that is connected to the PC. In addition, the printer need not be a wireless printer.

[0010] The wireless communication device of the present invention provides numerous advantages and functionalities.

[0011] Printing documents from mobile devices is made easy. Present communication device simplifies the user experience of data output from a mobile device. A user only needs to connect the communication device to a desktop PC or laptop or other computing device (e.g. through USB port). An embedded application in the communication device may be automatically launch in the PC. The user launches a client application on the mobile device (e.g. PDA, mobile phone, digital camera etc) can automatically recognizes the

service (e.g., printing) enabled by the communication device of present invention. The user just needs to select the document to be printed and the document is printed to a selected printer associated with the PC. Thus, wireless communication device of this invention simplifies the process of getting a print from the mobile device.

[0012] The communication device includes embedded software components that automate configuration of wireless connectivity. The present communication device automates the process of configuring the hardware (e.g. installation, un-installation), thus making wireless connectivity easy to use for non-technical users.

[0013] Present communication device can be used as an external disk drive. The present communication device is unique since it may also include storage or memory (e.g. flash Memory) that could cache or store data, in addition to the wireless communication capability. The memory component may be segmented into one or more logical segments such as a public area and a private area. The public area for example can be reserved for a user to save and retrieve data or files when the communication device is plug into a PC or laptop. In this case, the communication device is used as an external disk storage drive that a user can easily carry along with him.

[0014] The present communication device simplifies sending and retrieving of wireless data from one device another, and makes it easier to use and without compromising privacy and or security. Prior art methods requires user consent or permission from a second party before a first party could send or retrieve data wirelessly to or from the computing device of the second party. The present invention eliminates this requirement without sacrificing privacy and or security.

[0015] The present communication device could uniquely be used as a channel for distributing software products. The present invention ties-up the software functionality inside a communication device thus making it more difficult for software piracy or cloning of software comparing to other distribution channels such as CD.

- [0016]** The present communication device can be configured to retrieve data from only the second computing device (e.g. mobile device) of a selected mobile user, thus eliminating the risk of a third device accidentally retrieving data from the first computing device when the communication device is plugged into the first communication device.
- [0017]** No data is retained by the computing device where the communication device is connected. In the aforementioned printing scenario, if the user is using another person's desktop for printing, the user must be sure that no document or data is accidentally left on the desktop. When using another person's PC there is always concern that a confidential document could be left on the PC. In the present invention, one or more software components embedded in the device ensure that no data relating to the output of the digital document is retained by the computing device.
- [0018]** The communication device of present invention can include an optional battery. This enables the communication device to function on its own, without the need to be connected to a PC to draw power. Therefore, a mobile device can send and or retrieve files or data wirelessly to and from the memory component of the communication device directly anywhere (e.g., wireless device in the pocket of the user) without the need to plug the communication device to a PC for usage.
- [0019]** Printing is used as an example to illustrate the advantages of the communication device of present invention. It in no way constrains the scope of the invention. The communication device can embed different programs to provide a variety of functionalities through wireless communications between multiple computing devices such as display, presentation of data, secure wireless data transfer, games, instant messaging, internet access among others as it will be evident by one skilled in the art after a reading of the disclosure and its accompanied drawings.

[0020] Additional description and implementations of the present invention will be apparent from the detailed description of the preferred embodiment thereof, which proceeds with reference to the accompanying drawings.

Brief descriptions of the Drawings

[0021] Figs. 1-5 are block diagrams of embodiments of a communication device of the present invention.

[0022] Fig. 6 is a flow diagram of a wireless external data storage process providing data storage that is integral with wireless communication.

[0023] Fig 7 is a flow diagram that illustrates an exemplary process of using a communication device of the present invention.

[0024] Fig. 8. is a flow diagram of another exemplary method or process of using the communication device of the present invention.

[0025] Fig. 9 is a flow diagram of a wireless communication process that maintains security and privacy without requiring users to manually accept or reject actions.

[0026] Fig 10 is a block diagram illustrating a system where the communication device is used to enable output of data content from a computing device to one or more output devices.

[0027] Fig. 11 is a flow diagram for an exemplary data output process (e.g., printing) using the system configuration as shown in Fig. 10.

[0028] Fig. 12 illustrates a flow diagram for another exemplary data output process (e.g. presenting) using the system configuration as shown in Fig. 10.

[0029] Fig. 13 is a block diagram illustrating another system in which the communication device is used to enable output of digital document from a computing device.

[0030] Fig. 14 is a flow diagram showing an exemplary process of the present invention for wireless output of data content using the system shown in Fig. 13.

[0031] Fig. 15 is a flow diagram showing another exemplary process of the present invention for wireless display of data content using the system shown in Fig. 13.

[0032] Fig. 16 is a block diagram illustrating another system where the communication device is used to enable wireless device-to-device communication (e.g. messaging).

Detailed Description of Preferred Embodiment

[0033] Fig. 1 is a block diagram of one embodiment of a communication device 100 of the present invention. The communication device 100 includes a structural interface 110, such as USB (universal serial bus) interface, and a wireless component interface 120. Interface 110 can be any structural interface including, but not limited, to USB, FireWire (IEEE 1394), CF (compact flash), SD (secure digital), parallel, serial, among others, that enables device 100 to plug into a computing device 170. The wireless interface 120 may be implemented using any wireless –medium such as infrared or radio communication according to any protocol including but not limited to Bluetooth, IEEE 802.11a, IEEE 802b(WiFi), IEEE 802.11ab, IEEE 802.11g, IEEE 802.11f, IEEE 802.15, IEEE 802.17, ZigBee among others.

[0034] The communication device 100 includes a memory component 130 that may include volatile memory (e.g., ROM, RAM) and or non-volatile memory (e.g., flash memory, hard disk). One or more software components or applications (not shown) may be stored in the memory component 130. The software components or applications stored in the memory component 130 may include programs or functionalities that enable device 100 to “auto run” or “auto play” so that, when the communication device 100 is connected with interface 110 to a computing device 170, the program or software application will be automatically installed, launched and executed in the computing device 170, as will be described in detail below. The memory component 130 may include a program memory segment 140 and an optional separate file memory segment 150. Programs or

software applications can be stored or embedded in the program memory 140. The software programs or applications may or may not be viewed or edited (e.g., added, deleted or changed) by a user. Hence program memory segment 140 can be implemented as a private or secure section of the memory component 130.

[0035] As an optional feature, file memory segment 150 may provide for additional file or data storage, run time buffering of data, or caching of data and files for faster access. The file storage component 150 is an example of an implementation of such memory segmentation. This component 150 may be optional and may or may not exist depending on implementation. Files and data stored in the file storage memory component 150 typically can be saved, retrieved, viewed or edited by a user through a computing device. As an example, the communication device 100 can be used as an external disk drive (e.g., "Flash drive") that a user can access and use as separate data storage drive when device 100 is plugged into the computing device 170.

[0036] The communication device 100 may include an optional external control switch 165, which can be used to activate, deactivate, control or adjust one or more functions provided by the device. The communication device 100 may also include an interface or status indicator (not shown) such as an LCD displaying text or image, lights or sound for status indication.

[0037] As is known in the art, wireless interface 120 may include a radio, a baseband controller and separate internal memory (not shown). The separate internal memory, implemented with Flash, RAM and or ROM circuitry, can store instructions and data required for proper functioning of the wireless component 120, such as a wireless protocol stack. Wireless component interface 120 may include a internal processor (not shown) that implements the instructions and logic for complying with wireless protocols (e.g. Bluetooth or IEEE 80211, a,b,g,f, among others), in addition to

managing the radio and the baseband of the wireless component interface 120.

[0038] Computing device 170 (e.g. PC, laptop, server) includes at least one structural interface 172 to which interface 110 of communication device 100 is connectable. In a typical implementation, structural interface 172 is a USB interface, however other interfaces such as parallel, serial, Firewire (IEEE 1394 a, 1394 b), CF (compact flash), SD (secure digital), Ethernet or wireless interfaces can also be implemented. To simplify the following description of the invention, interfaces 110 and 172 will be referred to a USB interfaces. It will be appreciated, however, that interfaces 110 and 172 could alternatively be implemented with any other interface format.

[0039] A computing device 180 (e.g., PC, laptop, server, PDAs such pocket PC, Palm, Symbian, Java or Linux cell phones, digital cameras, etc.) includes a wireless interface 182. The communication device 100 can communicate with the computing device 180 via wireless interface 120. Examples of wireless interface 120 that can be implemented include Bluetooth, IrDa, ZigBee, IEEE802.11 A, B, F and G, among others.

[0040] Fig. 2 is a block diagram of another embodiment of a communication device 200 of the present invention. Elements of the communication device 200 that are common to or the same as elements of communication device 100 are indicated by the same reference numerals. In addition, the communication device 200 includes a controller 260, which may comprise of a microprocessor. Other implementations of the controller 260 are and may include a digital signal processor (DSP), a system-on-a-chip (SOC), FPGL, ASIC etc. In this implementation, the memory component 130 may also store programs to be executed by the controller 260. Examples of functionality and components operable by controller 160 may include any combination below and are not limited to:

- A communication protocol stack component (e.g., USB interface or Bluetooth stack, data or format conversion).
- Communication and or security management software (e.g., protocol encoding/decoding, encryption/decryption, and authentication).
- Control modules and components for managing the radio and baseband component of wireless interface 120.
- AutoRun components that provide and control automatic installation and launching on the computing device 170 of one or more programs stored in 140 when the device 100 is plugged into computing device 170.
- Control and management of the structural interface 110 (e.g. USB, FireWire etc)

[0041] The controller 260 may or may not include an operating system. An advantage of the implementation of communication device 200 in Fig. 2 is that it may have a reduced chip count or hardware component cost compared to some implementations. For example, the functionalities of multiple components of a communication device of this invention may be implemented and managed with a single processor in the controller 260, rather than employing multiple controller/processor implementations.

[0042] Fig. 3 is a block diagram of another embodiment of a communication device 300 of the present invention. Elements of the communication device 300 that are common to or the same as elements of communication device 100 are indicated by the same reference numerals. In Fig. 3, the memory component 130 acts and may include a hub for the wireless interface 120. Memory component 130 may include a controller or processor (not shown). In Fig. 1, the wireless interface 120 and memory component 130 are connected to the USB interface 110.

[0043] As discussed, memory component 140 can be implemented depending on the application. All above features and requirements can be implemented in a single memory component

130, segmented in to two components 140 and 150, or segmented into three components 144, 146, and 150 as illustrated in Figs. 4 and 5.

[0044] Figs. 1-3 show memory component 130 segmented into two sections, private section or program section 140 and public section or file storage section 150. The public file storage component 150 corresponds to memory that can be accessed by the end-user. This optional component 150 allows a user to save and retrieve data when device 100 is plugged into the USB interface of computing device 170. This public memory section 150 (e.g., flash) can also be exposed for public wireless access. Program memory section 140 is private and end user cannot access it.

[0045] Figs. 4 and 5 illustrate as additional implementations respective communication devices 400 and 500 of the present invention. Elements of the communication devices 400 and 500 that are common to or the same as elements of communication device 100 are indicated by the same reference numerals.

[0046] In communication devices 400 and 500 private memory component 140 is segmented into two sections: internal section 144 and embedded section 146. Internal memory section 144 can store data and programs required for proper functioning of the communication device 100. These programs and data can be accessed by a memory controller 415 and support its functionalities. Embedded memory section 146 can store programs, applications, and data that will be installed or launched on computing device 170 when communication device 100 is plugged into computing device 170. The software program or applications typically may not be viewed or edited (e.g., added, deleted or changed) by user and is embedded during the manufacture of devices 400 and 500.

[0047] Memory controller 415 manages communication with the structural external interface 110 (e.g., USB, FireWire, etc.) and memory component 130. Memory controller 415 can be implemented with a microprocessor, DSP, ASIC, etc and may include internal

memory for running its program. Additional memory such as those provided by internal memory section 144 can also be implemented if needed. Examples of the functionality and software components that may be implemented with the memory controller 415 include “auto run” or “auto play” functionalities, segmentation of memory 130, data security, and USB interfacing functionalities, among others.

[0048] Communication device 400 includes a hub component 425 (e.g., a chip), which combines the components of wireless interface block 120 with the memory component block 130 and its memory controller 415. The hub 425 enables sharing of the same external structural interface 110 (e.g., USB, FireWire) between wireless component 120, memory controller 415 and memory component 130.

[0049] Figs. 1-5 each illustrates an optional battery 167 being included in the respective communication devices 100-500. Optional battery 167 enables each of communication devices 100-500 to receive or send data wirelessly without being plugged into a computing device 170. Typically, each communication device 100-500 draws its operating power computing device 170 when plugged into its interface 172 (e.g., USB).

[0050] Communication devices 100-500 of the present invention provide users of mobile devices 180 (e.g., wireless enabled digital camera, mobile phone, etc.) data storage that is integral with the wireless communication and may be independent of computing device 170. In accordance with the present invention, each of communication devices 100-500 can be configured to communicate in a point-to-point manner with a wireless-enabled mobile device 180 (e.g., a Bluetooth digital camera, phone etc). An embedded application (not shown) stored on each wireless device 100-500 can manage the communication with an embedded application in the mobile device 180.

[0051] Fig. 6 is a flow diagram of a wireless external data storage process 600 providing data storage that is integral with

wireless communication. The following descriptions refer to “communication device 100-500” as a singular device to emphasize that the referenced communication device could be any implementation of a communication device of the present invention.

[0052] In step 602, a wireless communication channel is established between mobile device 180 and communication device 100-500. This step may include additional steps of negotiating the service options between an application in the mobile device 180 and wireless device 100-500 through an interface. The interface may be part of an application GUI (Graphical User Interface) in the mobile device 180 or as part of a switch or display settings provided by the wireless device 100-500.

[0053] In step 604, mobile device 180 obtains or accesses digital content. For example, a photo may be taken with a digital camera or camera phone 180 and the photo stored into a memory component of the mobile device 180 (e.g., flash memory).

[0054] In step 606, the mobile device 180 sends the digital content wirelessly to communication device 100-500 automatically upon a predefined condition being met. For example, the predefined condition can be that the data storage contained in the mobile device 180 exceeds a certain preset threshold. The preset threshold can be the maximum storage capacity of the mobile device 180, any other storage level, or any other condition.

[0055] In step 608, wireless communication device 100-500 stores the transmitted data into the available memory component 150 of device 100-500 for storage. Optionally, communication device 100-500 may return 100-500 a signal or other type of indication to the user of the mobile device 180 if the capacity of memory capacity in communication device 100-500 is reached.

[0056] In step 610, communication device 100-500 is plugged into a computing device 170, the data stored in the wireless device 100-500 is transferred to, synchronized with, or stored in the computing device 170 (e.g., on a hard drive). For example, this step

may be performed by an embedded application that automatically launches and runs on the computing device 170. This step may be automatic, or partially automatic or manually aided by the user through a GUI that runs in the computing device 170.

[0057] In step 612, the data storage area 150 can be cleared manually by the user, automatically or a combination after the digital content has been transferred to computing device 170, thereby enabling communication device 100-500 to wirelessly receive additional data from the mobile device 180.

[0058] Fig 7 is a flow diagram that illustrates an exemplary method or process of using a communication device 100-500 of present invention.

[0059] In step 710, the communication device 100-500 is connected to computing device 170. For example, the connection may use a USB interface or FireWire interface.

[0060] In step 720, communication is established between the device 100-500 and computing device 170. For example, the device 100-500 engages dialog with the computing device 170 using one or more standard protocols that are built-into the operating system of the computing device 170 (e.g., a "Plug and Play" feature for USB, and others). In this implementation, the device 100-500 is immediately recognized by the computing device 170 once the connection is made (i.e., no driver or software installation is required). Alternatively, software such as a driver for setting-up communication between the device 100-500 and the computing device 170 may be provided to a user separately (e.g., on a CD or downloaded from a network) if the operating system of the computing device 170 does not include an immediate plug and play feature. In this case, a user installs the software in the computing device 170 so that the device 100-500 can be recognized.

[0061] In step 730, one or more applications stored in the memory component 130 may be automatically installed and launched in the computing device 170 when the device 100-500 is connected to

the computing device. The installation and launching of the application that is embedded or stored in the communication device 100-500 may be implemented using the “Auto Run” or “auto play” feature, which may be provided by the operating system or software installed in the computing device 170 to automatically launch the program that is stored in the memory component 130 of the communication device 100-500. In one implementation, a pointer may be embedded in the dialog between the device 100-500 and computing device 170 in step 720. The pointer would point to a setup file in the memory component 130 that instructs the computing device 170 to install or run one or more applications stored in the memory component 130. Operating systems can also provide certain means to add entries to AutoRun executables. The various different applications that are stored in the communication device 100-500 may perform various tasks in the computing device 170. For example, they may help manage wireless communication between the computing devices 170 and 180 through wireless interface 120, perform presentations (e.g. PowerpointTM), or perform any of numerous other tasks or operations, some of which are described later with reference to Figs. 10-16.

[0062] In step 740, which is an optional step, a user interacts with the launching of an application from the memory component 130 or the subsequent execution of the application on the device 170. As one example, optional user consent or acceptance may be obtained before the application is installed and run in the computing device 170. As another example, a user may control the execution process of the application, such as giving command to initiate, pause, cancel, or abort the application. User interaction options can be implemented by a GUI (graphical user interface) provided (1) locally in the computing device 170, or (2) remotely from another computing device 180 through wireless communication associated with controlling/interacting with the application stored in the communication device 100-500. In addition, a user may optionally

activate/deactivate the communication device 100-500 or one or more of its functions by using the external switch 165 if those options are implemented.

[0063] In step 750, if the communication device 100-500 is disconnected from the computing device 170, a disconnection signal is received or intercepted by one or more applications launched in step 230. In one implementation, these applications can automatically uninstall the application or applications from computing device 170, and including itself or themselves and may delete any data stored thereon. In this case, no data from the computing device 180 will be retained in the computing device 170 after the communication device is unplugged, thus enhancing privacy and security.

[0064] Uninstalling all applications and deleting all data residing in computing device 170 when device 100-500 is disconnected from computing device 170 has the advantage of ensuring privacy for a user of computing device 170 and also protects the manufacturer of the device 100-500 against piracy of the software applications launched in step 730. The communication device 100-500 in this case functions as a security key. When device 100-500 is no longer plugged into the computing device 170, all software applications previously launched can be uninstalled and all data may be deleted – restoring the computing device to its initial state prior to the device 100-500 being plugged in.

[0065] Step 750 can also be implemented in various ways, depending on the type of application. When device 100-500 is disconnected from computing device 170, the one or more applications launched in step 830 can also be configured to uninstall applications and delete data only in part so that only certain application modules and data are removed. One advantage of this implementation is that when communication device 100-500 is again plugged into computing device 170, some installation and setup processes can be skipped and the application will launch faster. As

another alternative implementation, all applications and data can be retained in the computing device 170 when communication device 100-500 is unplugged. This may be preferred in certain cases such as if privacy and security is not an issue.

[0066] Fig. 8 is a flow diagram of another exemplary method or process of using the communication device 100-500 of present invention.

[0067] In addition to the basic operations described with reference to Fig 7, the communication device 100-500 of present invention may include additional components, means and features for using it as (1) external disk drive for storing, transferring, and retrieving user documents between computing devices, and (2) for adding wireless communication capability to computing device 170 for communicating wirelessly with other computing devices such as computing device 180. The combination of the above features in a single communication device 100-500 enhances the versatility of the communication device of present invention.

[0068] In step 810, wireless device 100-500 is plugged into a first computing device 170.

[0069] In step 820, wireless device 100-500 is detected by the first computing device 170 (e.g. Play and Play).

[0070] In step 830, a user may perform read or write operations with the file storage component 150 of the device 100-500 to use it as an external drive. For example, user may save digital documents to the file storage component 150 or retrieve digital documents stored in the storage component. Step 830 (designated process A) illustrates the communication device 100-500 being used as an external memory drive after communication has been established between the device 100-500 and the computing device 170 such as through a USB interface. No installation of software or driver is needed for using this feature of the device 100-500.

[0071] In step 840, the wireless communication means of communication device 100-500 is enabled and activated. Software

stored in the device 100-500 may be automatically installed or launched. For example the appropriate wireless communication protocol stack may be installed or launched in the computing device 170, if the computing device 170 does not already have one pre-installed. Such protocol stacks may be automatically launched and installed in the computing device 170 as one of the applications stored in the program memory component 140. User may or may not need to interact with this installation process. In this example, the communication device 100-500 automatically adds wireless capability to the computing device 170 by just plugging in the device 100-500.

[0072] In step 850, the computing device 170 may now interact with other wireless enabled devices through the wireless interface 120 of device 100-500. The wireless communication may be enabled with an additional service discovery and selection step. Steps 840 and 850 (designated process B) show the communication device 100-500 having the means for being used as a wireless communication adaptor (e.g., a Bluetooth dongle).

[0073] In step 860, an application stored in communication device 100-500 is automatically installed in computing device 170 and launched. In step 870, a query is made as to whether the communication device 100-500 is disconnected from computing device 170. If no, step 870 returns to step 860. If yes, step 870 proceeds to step 880. In step 880, the application is terminated automatically. Steps 860-880 (designated process C) correspond to an autorun functionality described above with reference to Fig 7.

[0074] The communication device 100-500 of the present invention may include any or all of process A (step 830), process B (steps 840-850), or process C (steps 860-880) concurrently or in any combination (e.g. A, B, C, A&B, A&C, B&C, or ABC) for one or more implementations of the device 100-500. For example, an application that is stored in the program memory component 130 of the communication device 100-500 may be launched and executed in the computing device 170 to perform certain tasks (e.g. send and/or

receive message from other computing devices, or printing digital document to a printer connected to device 170). The application may require that the communication device 100-500 stay connected for interaction with other computing devices through the wireless interface 120 (e.g. to receive user command from computing device 180). In this example, both process B and process C are required and used.

[0075] Conventionally, whenever a first computing device sends, transfers, or retrieves a file or data wirelessly to or from a second computing device, a user must manually issue an accept or reject command for security and privacy reasons. The present invention improves upon such a conventional process without sacrificing security or privacy.

[0076] Fig. 9 is a flow diagram of a wireless communication process 900 that maintains security and privacy without requiring users to manually accept or reject actions, thereby making wireless communication easier to use. Process 900 combines processes A, B, and C for transferring files and/or data wirelessly from one device to another.

[0077] In step 902, wireless communication device 100-500 is plugged into a first computing device 170 (e.g., step 810).

[0078] In step 904, wireless device 100-500 is detected by the first computing device 170 (e.g., step 820), and a wireless application stored in memory component 130 is automatically launched such as through the process of Auto Run (e.g., step 860).

[0079] In step 906, the wireless application enables the communication device 100-500 to send and receive wirelessly data to and from another device 180 (e.g., step 840). A discovery process may be included in this step. The user of device 180 can then wirelessly transfer (e.g., send, receive or retrieve) a document from his computing device 180 (e.g., mobile phone, digital camera, PDA, laptop, etc.) to the communication device 100-500.

[0080] In step 908, computing device 180 can send or retrieve data to or from public storage component 150 of the wireless device 100-500 without the need for the user of the first computing device 170 to respond or grant permission (e.g., step 850, process B). The public storage component 150 of the wireless device 100-500 may be configured to be public, and wireless device 100-500 is connected externally to the computing device. This is in contrast to the hard drive of the first computing device 170, which is private to the user of the first computing device 170. Data is transferred to and from mobile device 180 with communication device 100-500 and not directly to and from the hard drive of the computing device 170.

[0081] In step 910, the user of the first computing device 170 can receive data sent from the second computing device 180 by retrieving the data or file received from computing device 180 and stored in the public storage area 150 of device 100-500 (e.g., step 830, process A).

[0082] Alternately, in step 912, if the user of the first computing device 170 desires to make available or public certain data or files for a second computing device 180, he can simply copy the data or file from his computing device 170 to the public storage area or component 150 of communication device 100-500 (e.g., step 330). The files and data in the public area in the communication device 100-500 become available for other users, and the second computing device 180 can now retrieve the file wirelessly from the public storage area of the memory component 150 in device 100-500 (e.g., step 850, process B).

[0083] In step 914, wireless device 100-500 is unplugged and the application that was launched in the computing device 170 may be uninstalled and all data may be totally or partially deleted (process C)

[0084] Figs. 10-16 illustrate additional exemplary implementations of communication devices 100-500 according to the present invention and various applications that may be stored in the memory

component 130 can be launched for execution and processing in the computing device 170.

[0085] Fig. 10 is a block diagram illustrating a system where the communication device 100-500 is used to enable output of data content from a computing device 1020 to one or more output devices 1040 that are connected to a computing device 1030.

[0086] Examples of computing device 1030 include but are not limited to desktop PCs, laptop PCs, tablet computers, servers, PDAs, and handheld computers. The computing device 1030 has at least a USB interface, for example, which can connect to the communication device 100-500 of present invention. Other interfaces are also possible as described above.

[0087] Computing device 1020 includes, but is not limited to, desktop PCs, laptop PCs, tablet computers, servers, PDAs, handheld computers, Internet information appliances, mobile phones, web pads, digital cameras, and combinations of these devices. The computing device 1020 has at least a wireless interface that can communicate with the communication device 100-500 through wireless communication protocols such as Bluetooth, Infrared, IEEE 801.11a, IEEE 801.11b (WiFi), IEEE 801.11g, Zigbee, among others. It should be noted that although only one computing device 1020 is shown here, the computing device 1030 with the connected device 100-500 may service more than one computing device 1020 concurrently or alternatively or in combination. In this case, the application 1010 may provide features such as queuing and spooling.

[0088] Application 1010 correspond to one or more software components or applications stored or embedded in the memory component 130 of the communication device 100-500. As discussed earlier, application 1010 may be launched and executed automatically in the computing device 1030 when device 100-500 is connected to computing device 1030. For example, application 1010 may AutoRun when device 100-500 is connected to device 1030, with no driver or application installation by the user being necessary. In this particular

example, the application 1010, after launching in the computing device 1030, may perform one or more of the following operations:

- Establish a communication channel with computing device 1020 and application 1022. This operation may further include a discovery process as well as sending of information relating to the service that computing device 1030 can provide to computing device 1020.
- Receive or retrieve digital data content from mobile computing device 1020. Data content includes still images, documents (Word processing documents, presentation documents, images, text, spreadsheets, Web pages etc), video images, and or sound data. Data content may be received from computing devices 1020 through wireless communication. Alternatively, the data content can be retrieved from the file storage component 150 of the communication device 100-500. In this case, the data content may have been already stored by the user into the memory component 130 before communication device 100-500 is connected to computing device 1030, or the data content may have been previously received from a computing device (e.g., computing device 1020) and cached in the memory component 130 temporarily or permanently due to a previous similar operation on the same document.
- Process the digital data received in computing device 1030. This may include one or more components and operations for:
 1. Decrypting/decompressing the received data content (e.g., digital document).
 2. Parsing or interpreting the data content.
 3. Converting the data content to a format suitable for input to one or more output devices 1040 connected to the computing device 1030. Converting of the data may be performed by the same software application, or a

separate application may be launched to perform such data conversion⁴. Monitoring and providing information on the output process (e.g., status, payment information, time left to complete, error messages, etc.) through a graphical user interface (GUI) on the computing device 1020 or 1030;

5. Receiving and implementing user instructions to the output process (e.g., initiate, pause, or cancel);

6. Invoking other applications (e.g. a driver application) residing in the computing device 1030 to participate in one or more of the above processes or operations. As an example, a printer driver or raster image processor application may be launched to process or convert the data content suitable for input to a selected output device 1040 associated with or connected to computing device 1030.

7. Queuing and spooling digital documents if more than one digital document are received from one or more computing devices 1020. The temporary queuing of the data can be in the memory or storage component 130 or in the memory or storage in the computing device 1030.

- Output the data content received or to be received to one or more selected output devices 1040 associated with or connected to computing device 1030.
- After detecting the disconnection of the communication device 100-500, the one or more programs 1010 may completely or partly uninstall and/or delete themselves as well as any other applications launched from the communication device 100-500 to the computing device 1030. Any temporary data that was not previously in the computing device 1030 may also be deleted.

[0089] In addition to the application 1010 above, the memory or storage component 130 of the communication device 100-500 may

include other programs (not shown) that can be launched and executed in the computing device 1030. An example of such a program is a portion or the entire wireless communication protocol stack that allows the computing device 1030 to communicate with other computing devices wirelessly through the wireless interface 120 of communication device 100-500. Another example of application 1010 includes components that execute and/or control a presentation program (e.g. PowerPoint®) with the presentation file received and being controlled wirelessly from computing device 1020.

[0090] Application 1022 is a software application residing in the computing device 1020. The application 1022 may include any or all of the following components and functionalities:

1. Discover the existence of one or more computing devices (e.g. computing system 1035) through wired or wireless communication links. This step may further include automatically or manually selecting one or more computing devices 1030 for providing service from a list of discovered computing devices 1030.
2. Establish communication with computing system 1035 and with application 1010.
3. Receive information from computing system 1035 such as through application 1010. The received information may include one or more of the following: (1) the number and type of output devices (e.g. printers, display devices and projectors) connected to or associated with computing system 1035 that is available for service to computing device 1020. (2) The type and quality of service, (3) availability of service, (4) price and billing information among others.
4. Transmit data content to computing system 1035.
5. Encrypt and/or compress the data content prior to data transmission.
6. Receive information from computing system 1035 related to the status of the output process (e.g., output status, payment

requirement, time left to complete, error messages, quality of service selected etc.) from the application 1010.

7. Provide a GUI in the computing device 1020, that enables user of computing device 1020 to (1) select a computing system 1035 among a list of available computing systems discovered for service, (2) select one or more output devices 1040 associated with selected computing system 1035 for providing the output service. (3) Display information on the output process (e.g. status, time left to complete, error messages, etc.) and/or give instruction to adjust the output process (e.g. provide payment, initiate, pause, cancel, change of service etc).

8. Transmit user command to the application 1010, whereby allowing the user to remotely control the output process of computing system 1035 from the computing device 1020.

[0091] Blocks 1040 represent output devices. Printers, projectors and monitors are shown as examples of output devices. However, output devices may also include TVs, fax machines, multifunctional machines (e.g. printer/fax/scanner), copiers, sound output systems, among others.

[0092] Fig. 11 shows a flow diagram for an exemplary data output process 1150 (e.g. output or printing of digital document) using the system configuration as shown in Fig. 10.

[0093] In step 1160, a user has a document in his mobile computing device 1020 that he wishes to print. He connects his communication device 100-500 to the computing device 1030 such as through a USB interface. As discussed earlier, communication is then established between the communication device 100-500 and the computing device 1030.

[0094] In step 1165, application 1010 stored in the device 100-500 is launched in the computing device 1030. Optionally, if the wireless communication stack is not already included in application 1010, another program (e.g., which includes wireless communication

protocol stack) can also be launched to allow the computing device 1030 to communicate with other devices wirelessly.

[0095] In step 1170, application 1022 residing in the computing device 1020 interacts with application 1010 launched in the computing device 1030 to manage or negotiate the data transmission process. User of computing device 1020 may select from a GUI in his mobile device 1020 one or more output devices 1040 associated with or connected to the selected computing system 1035 for providing the output or rendering service. Application 1022 may transmit data content 1024 from the device 1020 to device 1030 through wireless communication link 1015. Application 1022 may encrypt and or compress data content 1024 before transmission.

[0096] In step 1175, the data content 1024 received by the device 1030 is further processed. Such process may include, but not limited to, reading, parsing, interpreting, decrypting, and decompressing the data content 1024 received. Process 1175 may also include converting the data content to output data format (e.g. print data, image file) suitable for input to the selected output devices 1040 for output or rendering. These operations may be performed by the application 1010 in the computing device 1030. Or alternatively, application 1010 may invoke other applications (e.g. printer driver application) residing in the computing device 1030 to help in one or more steps in the further processing of the digital document 1024.

[0097] In step 1180, the further processed data content 1024 and generated output data is then sent to the output device 1040 for printing or rendering.

[0098] During the output process, user may obtain information related to the output process status through a GUI in the computing device 1020. The user may also provide instructions to adjust the output process or options through the GUI.

[0099] After the output process has been completed, the user may disconnect 100-500 from the computing device 1030. The application 1010 automatically exits and may remove or uninstall itself

from the computing device 1030. Any data that was used in connection with the output process may also be removed or deleted. No data of the content 1024 is left in the computing device 1030, which enhances privacy and security.

[00100] Fig. 12 illustrates a flow diagram for another exemplary data output process 1250(e.g. display or presentation of digital content) using the system configuration as shown in Fig. 10.

[00101] Steps 1260, 1265, and 1270 are identical to respective steps 1160, 1165, and 1170 shown in Fig 11.

[00102] In step 1275, the data content 1024 (e.g., a presentation file such as in a PowerPoint® format) is displayed or projected by output device 1040 (e.g., a projector).

[00103] In step 1280, the display of data content 1024 is controlled by device 1020. Such control may include, but is not limited to, starting or ending the display, going forward to the next page or backward to the previous page, enlarge or minimize the displayed image. Other exemplary features include reading notes of the presentation file with mobile device 1020, while the data content (without the notes) is projected to a projector 1040 through computing device 1030. A GUI may be provided in device 1020 for the user to perform the above-mentioned control.

[00104] After the presentation process has been completed, the user may disconnect device 100-500 from the computing device 1030. The application 1010 automatically exits and removes itself from the computing device 1030 as well as any data or file that was used in connection with the data output process. No data of the content 1024 is left in the computing device 1030.

[00105] Fig. 13 is a block diagram illustrating another system where the communication device 100-500 is used to enable output of digital document from computing device 1330 to output devices 1340 that are connected to computing device 1320. Computing device 1320 includes wireless communication capability. This may be enabled by built-in wireless hardware or by plugging in a

communication device 100-500 or by other wireless enabled external devices.

[00106] Application 1310 is stored or embedded in the memory component 130 of the communication device 100-500. As discussed earlier, application 1310 may be launched and executed in the computing device 1330 once the device 100-500 is connected to or plugged into computing device 1330. In this particular example, the application 1310, after launched in the computing device 1330, may include but not limited to any combination of the features below:

1. Install necessary drivers, application, and or wireless communication stack in the computing device 1330;
2. Discover the existence of other computing devices including 1320;
3. Receive information relating to one or more discovered devices (e.g. name, id, availability, type of service, service or communication options, quality of service, price etc.)
4. Transmit data content to the computing device 1320;
5. Encrypt and/or compress the digital document prior to the transmission;
6. Receive information on the output process (e.g. status, payment requirement, time left to complete, error messages, etc.) from the application 1325.
7. Provide a GUI in the computing device 1330. The GUI allows the user to select one or more computing devices for communication from a list of discovered computing devices available 1320. Further, the user may select one or more output devices 1340 from a list of available output devices that is connected to the selected computing device 1320. The GUI may further include means for user to obtain information on the output process and/or give instruction to the output process. For example this may include providing payment information, status information as well as GUI for controlling the functionality of

application 1325 such as initiating, pausing, or canceling the process.

8. Transmit user command to the application 1325, whereby allowing the user to remotely control the output process from the computing device 1330.

9. After detecting the disconnection of the device 100-500, perform a complete un-installation of all the applications installed or deletion of temporary files from the computing device 1330 and exit, leaving the computing device the same state as before the communication device 100-500 was connected. In another implementation, perform only a partial un-installation of the applications and or deletion of files. This may help speed up the setup time when device 100-500 is plugged in again the second time.

[00107] In addition to application 1310, the program memory 140 may include other programs that can be launched and executed in the computing device 1330. An example of such program is wireless communication protocol stack that allows the computing device 1330 to communicate with other computing devices wirelessly through the communication adapter's wireless interface 120.

[00108] Computing device 1330 includes, but not limited to desktop PCs, laptop PCs, tablet computers, servers, PDAs, handheld computers, Internet appliances, Web pads, mobile phones, and digital cameras among others. Preferably, computing device 1330 is a mobile device. The computing device 1330 has at least a USB interface, Firewire, SD (secure digital) interface or CF (compact flash) interface among others that can connect with the interface 110 (e.g., USB) of device 100-500. It should be noted that although only one computing device 1330 is shown here, the computing device 1320 (with the application 1325) may service more than one computing devices 1330 (connected to the communication device 100-500) either concurrently or in an alternative manner for providing service. For example, application 1325 may provide queuing and spooling

services based on one or more of quality of service, price, and availability means.

[00109] Examples of computing device 1320 include but not limited to desktop PCs, laptop PCs, tablet computers, servers, PDAs, handheld computers, and other dedicated computing devices. Computing device 1320 has at least a wireless interface which can communicate with the device 100-500 through one or more wireless communication protocols such as Bluetooth, Inferred, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11f, IEEE 802.15, IEEE 802.17, etc. As described earlier, the wireless interface of the computing device 1320 may be implemented by built-in wireless communication hardware or by external wireless adapters or by communication device 100-500.

[00110] Application 1325 resides in the computing device 1320. In this particular example, the application 1325 in the computing device 1320 may have the following components and functionalities:

1. Send and/or broadcast information to one or more computing devices such as announcing the availability for communication or service, type, options, price and or quality of service.
2. Receive data content from other computing devices (e.g., device 1330), or retrieve data content from the storage component of the computing device 1320.
3. Process the data content received, including one or more of:
 - Decrypting/decompressing the data content received.
 - Parsing or interpreting the data content.
 - Converting the data content to a format suitable for input to one or more output devices connected to the computing device 1320.
 - Monitoring and providing information on the output process (e.g. status, payment information, time left to complete, error messages, etc.) through a GUI in the computing device 1320 or 1330.

- Receiving and implementing user instructions to the output process (e.g. initiate, pause, or cancel).
- Invoking other applications (e.g. driver application) residing in the computing device 1320 to participate in one or more of the above process.
- Queuing and spooling data content if more than one output job is received from one or more computing devices 1330.
- Sending one or more output devices 1340 (e.g. printer, projector, monitor, etc.) data content for output.

[00111] Fig. 14 is a flow diagram showing an exemplary process 1450 of the present invention for wireless output of data content (e.g., digital document printing) using the system shown in Fig. 13. As an example of an application for this invention, a clerk of a photocopy print shop (e.g. Kinko's® or a business service lounge) may hand a communication device 100-500 to a customer who enters the shop. The customer has stored in his computing device 1330 a document that he needs to print. The customer just plugs the wireless communication device 100-500 into his computing device 1330 and easily prints out the document to one or more printers connected to the computing device 1325 that is available in the print shop.

[00112] In step 1460, a user connects communication device 100-500 to computing device 1430 through USB interface or another interface. As discussed earlier, communication and interaction is then established between the device 100-500 and the computing device 1330.

[00113] In step 1465, application 1310 stored in communication device 100-500 is launched in the computing device 1330. This may be launched automatically such as through an AutoRun process as previously discussed. Optionally, another program or component included in application 1310 (e.g., a wireless communication protocol stack) may also be launched in the computing device 1330 from the memory component of the device 100-500 to allow the computing device 1330 to communicate with other devices wirelessly. In step

1465, application 1310 may further include a discovery and selection of the computing device 1325 from among a list of available computing devices available for communication. Information relating to the output device 1340 associated with computing device 1325 may be received and displayed to the user at the computing device 1330 so the user can select the output device 1340.

[00114] In step 1470, user transmits data content 1335 (e.g., a digital document) from computing device 1330 to computing 1320 through wireless communication link 1315. Application 1325 residing in the device 1320 communicates with application 1310 running in the computing device 1330 to manage the transmission process. Application 1310 may provide a GUI in device 1330 where the user can obtain information on the output process or interact and control the output process. The application 1310 may encrypt and or compress data content 1335 before transmission.

[00115] In step 1475, the data content 1335 (e.g., digital document) received by the device 1320 is further processed. Such processing may include, but is not limited to, reading, parsing, interpreting, decrypting, and decompressing, raster image processing the digital document 1335 received. One or more of these processes may include invoking one or more other applications (e.g. presentation application, printer driver, viewer software etc residing in computing device 1320). Process 1475 may also include converting the digital document to an output data format (e.g. print data, image file) suitable for input to one or more output devices 1340 associated with computing device 1320. These operations may be performed by the application 1325. Alternatively, application 1325 may invoke other applications (e.g. presentation application, printer driver application, viewer or browser application etc) residing in the computing device 1320 to help in one or more of the above described processes as well as steps for further processing of the data content 1335 (e.g., digital document).

- [00116]** In step 1480, the processed data content 1335 or output data is sent to output device 1340 (e.g. printer) for rendering (e.g. printing, displaying or projecting).
- [00117]** After the output process has been completed, the user may disconnect the device 100-500 from device 1330. Disconnecting device 100-500 triggers the application 1310 to automatically exit and remove itself as well as the traces of data relating to the data content 1335.
- [00118]** Fig. 15 is a flow diagram showing another exemplary process 1500 of the present invention for wireless display of data content (e.g. presentation of data to a projector) using the system 1300 shown in Fig. 13.
- [00119]** Steps 1560, 1565, and 1570 are identical to respective steps 1460, 1465, and 1470 shown in Fig 14. In step 1575, the data content 1335 in the mobile device 1330 is displayed by a projection device 1340, connected to or associated with computing device 1320.
- [00120]** In step 1580, the display of data content 1335 (e.g., a Power Point ® presentation file from Microsoft) is controlled by mobile device 1330. Such control may include, but not limited to, starting or ending the display, going forward to the next page or backward to the previous page, enlarge or minimize the displayed image. A GUI may be provided in mobile device 1330 for user to perform the above-mentioned control. Notes related to the presentation pages may be displayed in the GUI of 1330 as an optional feature while the notes do not need to be displayed on by the projector 1340 during the presentation of the presentation file.
- [00121]** After the wireless presentation process has been completed, the user may disconnect device 100-500 from device 1330. Disconnecting device 100-500 triggers the application 1310 to automatically exit and remove itself as well as the trace of data relating to the data content that may reside in communication device 100-500.

[00122] Fig. 16 is a block diagram illustrating another system where the communication device 100-500 is used to enable wireless device-to-device communication (e.g. messaging).

[00123] Computing device 1610 may include, but is not limited to, desktop PCs, laptop PCs, tablet computers, servers, PDAs, handheld computers, Internet appliances, mobile phones, and digital cameras.

[00124] Application 1630 is stored in the memory component 130 of the communication device 100-500. Once the communication device 100-500 is connected with the computing device 1610, the application 1630 is launched and executed in the computing device 1610. The application 1630 can be launched automatically with AutoRun previously discussed. Fig. 16 illustrates two separate communication devices 100-500 plugged into two distinct computing devices 1610, enabling the two computing devices 1610 to communicate wirelessly such as messaging and or transferring data among the two computing device 1610.

[00125] In this particular example, the application 1630 is a messaging application. The application 1630 may include one or more of the following components and functionalities including but not limited to:

1. Adds wireless capability to computing device 1610. Application 1630 may include a wireless stack, which enables computing device 1610 to communicate wirelessly with another device through the use of communication device 100-500.
2. Discover one or more computing devices available for wireless communication.
3. Providing a GUI where user may enter authentication information (e.g. password, PIN #, biometric information) to be connected/logged into a specific group through wireless communication.
4. Receive and interpret authentication information provided by other computing devices before establishing communication channel with that device.

5. Implement GUI in the computing device 1610 where user can compose and send messages to be transmitted to other computing devices.
6. Implement GUI in the computing device 1610 where user can receive and view messages transmitted to the other computing devices.
7. Encrypt/decrypt, and or compress/decompress messages before sending and receiving. Different encryptions may be implemented for different user groups to ensure privacy.
8. Send and receive files or documents to the public memory component 150 of communication device 100-500 (e.g. flash memory) among the computing devices 1610 that has communication device 100-500 plugs in.

[00126] In addition to application 1630, the program memory 140 may include other programs that can be launched and executed in the computing device 1610. An example of such program is wireless communication protocol stack that allows the computing device 1610 to communicate with other computing device wirelessly through the wireless communication interface 120 of device 100-500.

[00127] Other examples of Application 1630 that can be launched when device 100-500 is plug in to computing device 1610, include communicate and sharing of service privately through local point to point wireless communication link 1640. Examples of local wireless point-to-point communication include instant messaging, e-mail, phone calls. Other services that can be shared among the users of computing device 1610 include Internet access, transfer and sharing of files, document editing collaboration, printer and other output devices etc.